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This paper is responsive to an Office Action dated January 8, 2007. Prior to this response, claims 1-4, 6-11, 13-19, and 21-27 were pending. After amending claims 1, 5, and 13, claims 1-4, 6-11, 13-19, and 21-27 remain pending.

The Office Action has rejected claims 1, 3, 5, 11, 21, 23-24, and 26 under 35 U.S.C. 102(e) as anticipated by Suzuki et al. ("Suzuki"; US 6,548,342). With respect to claims 1, 5, 24, and 26, the Office Action states that Suzuki describes all the elements recited in the above-mentioned claims including a RuO conductive oxide layer. With respect to claims 3 and 1, the Office Action states that Suzuki discloses a top electrode made from a conductive oxide. With respect to claim 21, the Office Action states that Suzuki discloses a ferroelectric material having a lattice structure that matches the lattice structure of the underlying conductive oxide layer. With respect to claim 23, the Office Action states that Suzuki discloses a ferroelectric material having a perovskite lattice structure. This rejection is traversed as follows.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Claims 1 and 5 have been amended to cancel the recitation of the conductive oxide materials mentioned in col. 9 (the 4<sup>th</sup> embodiment) of the Suzuki disclosure. Since Suzuki does not explicitly disclose every element of amended claims 1 and 5, he cannot anticipate. Claim 3,

dependent from claim 1, and claim 11, dependent from claim 5, also enjoy the same distinctions from the Suzuki reference, and the Applicant respectfully requests that the rejection be removed.

With respect to claims 21, 24, and 26, Suzuki does not disclose any ferroelectric transistor devices. It should be appreciated that any problems associated with building a ferroelectric memory device overlying a simple substrate (Suzuki) would be trivial compared to the problems of building a ferroelectric memory as part of a gate electrode overlying a channel region. Alternately stated, there is no evidence that Suzuki's structure could function as a gate electrode. The interface between gate electrode and channel region is non-trivial. Since Suzuki does not disclose a conductive oxide layer overlying a transistor channel region, he cannot anticipate claims 21, 24, and 26. Claim 23, dependent from claim 21, enjoys the same advantages, and the Applicant requests that the rejection be removed.

Further, with respect to claim 21, the Office Action states that Suzuki discloses a ferroelectric material and underlying conductive oxide material with matching lattice structures, citing col. 1, ln. 48, through col. 2, ln. 14. However, the cited section of the Suzuki disclosure merely mentions that a ferroelectric material can have a perovskite lattice structure. Suzuki is absolutely silent of the subject of the lattice structure of a conductive oxide layer underlying the ferroelectric. That is, Suzuki does not disclose a ferroelectric layer and underlying conductive oxide layer having matching lattice structures. With respect to claim 23, Suzuki does not disclose a conductive oxide film with a lattice structure that matches a perovskite crystal lattice structure. Since Suzuki does not

explicitly disclose all the elements of claims 21 and 23, he cannot anticipate, and the Applicant requests that the rejection be withdrawn.

Claims 2, 6, 22, 25, and 27 have been rejected under 35 U.S.C. 103(a) as being unpatentable with respect to Suzuki in view of Willer et al. ("Willer"; US 6,538,273). The Office Action acknowledges that Suzuki does not describe a bottom conductive layer, but states that Willer describes a ferroelectric transistor with a bottom conductive layer. The Office Action also states that Willer and Suzuki are in the same field of endeavor, that the purpose disclosed by Willer would have been recognized in the pertinent art of Suzuki, and that it would have been obvious to modify Suzuki to add a bottom conductive layer to improve the punch-through voltage. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1438 (Fed. Cir. 1991).

Willer describes a ferroelectric transistor with a metallic intermediate layer made up of an interfacial layer 41 of  $WSi_2$  and an

overlying metal layer 4<sub>2</sub> of platinum (col. 5, ln. 6-12). The ferroelectric layer 5 overlies the platinum layer 4<sub>1</sub>.

With respect to claims 2 and 6, the Willer and Suzuki references have been combined based upon the assumption that Suzuki anticipates one of the conductive oxide materials recited by the Applicant in claims 1 and 5. As noted above, Suzuki does not anticipate the conductive oxide materials recited in amended claims 1 and 5. Willer discloses a Pt layer (4<sub>2</sub>) interposed between the ferroelectric 5 and the WSi2 (4<sub>1</sub>). Thus, Willer discloses a different (Schottky diode) structure, as well as different materials. With respect to the third *prima facie* requirement, even if Willer and Suzuki are combined, they do not explicitly disclose the structure and materials recited in claims 1 and 5. Claims 2 and 6, dependent from these claims, enjoy the same advantages.

Again, with respect to claims 22, 25, and 27, the Willer and Suzuki references have been combined based upon the assumption that Suzuki anticipates the devices recited by the Applicant in claims 21, 24, and 26, which include a ferroelectric device formed overlying a channel junction. As noted above, Suzuki is absolutely silent on the subject of forming a transistor ferroelectric device. While Willer does disclose a ferroelectric transistor, the Schottky diode structure of his device is different from the structures recited in claims 21, 24, and 26. As noted above, Willer discloses a Pt layer (4<sub>2</sub>) interposed between the ferroelectric 5 and the WSi2 (4<sub>1</sub>). Willer discloses a Pt layer underlying the ferroelectric layer, which is not recited in the Applicant's claims. Further, Willer fails to disclose the use of a conductive oxide material overlying the transistor channel region. With respect to the third *prima facie* requirement, even if Willer and Suzuki are combined, they do not

explicitly disclose the structure and materials recited in claims 21, 24, and 26. Claims 22, 25, and 27, dependent from these claims, enjoy the same distinctions.

With respect to the first *prima facie* requirement, the Office Action states that the purpose disclosed by Willer would have been recognized in the pertinent art of Suzuki, making it obvious to modify Suzuki. However, even if this statement were correct, it does not explain how an expert in the art could have modified the Suzuki reference in such a way as to describe the claimed invention. As explained above in response to the third *prima facie* requirement, even when combined, Suzuki and Willer fail to disclose all of the claimed invention limitations. The above-quoted statement from the Office Action does not explain how even a person with skill in the art could modify Suzuki's ferroelectric device (fabricated on a simple substrate), to operate overlying a channel region as a gate electrode. A *prima facie* case has not been made that any modification that would make the claimed invention obvious comes from the combination of Suzuki and Willer references. This assertion is true simply because all the Applicant's claim limitations cannot be found in the two references.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Suzuki/Willer references, then additional evidence must be provided. Notable, when the source or motivation is not from the prior art references, "the evidence" of motive will likely consist of an explanation or a well-known principle or problem-solving strategy to be applied". *DyStar*, 464 F.3d at 1366, 80 USPQ2d at 1649. The Examiner has not supplied

any explanation of how an expert could possible modify either Suzuki or Willer to yield all the explicit limitations recited in the base claims.

Considered from the perspective of the second *prima facie* requirement, even if an expert were given the Suzuki and Willer inventions as a foundation, no evidence has been provided to show that there is a reasonable expectation of success in the claimed invention.

In summary, the Applicant respectfully submits that a *prima facie* case of obvious has not been supported, and the Applicant requests that the rejection of claims 2, 6, 22, 25, and 27 be removed.

Claims 7-10 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Suzuki in view of Moon (US 5,744,374). The Office Action acknowledges that Suzuki fails to disclose a multilayer gate stack, but states that this feature is described by Moon. The Office Action also states that Moon and Suzuki are in the same field of endeavor, that the purpose disclosed by Moon would have been recognized in the pertinent art of Suzuki, and that it would have been obvious to modify Suzuki to use a multilayer gate stack. This rejection is traversed as follows.

The Moon and Suzuki references have been combined based upon the assumption that Suzuki anticipates one of the conductive oxide materials recited by the Applicant in claim 5. As noted above, Suzuki does not anticipate the conductive oxide materials recited in amended claim 5. Moon describes a ferroelectric transistor with an oxide layer (Y<sub>2</sub>O<sub>3</sub>) 11a over the substrate, an FE layer 12a over layer 11a, and a top electrode 13a over layer 12a. Like Suzuki, Moon fails to disclose any of the conductive oxide materials explicitly recited in Applicant's claim 5. With respect to the third *prima facie* requirement, even if the Moon and

Suzuki inventions are combined, the combination does not describe any of the conductive oxides listed in claim 5. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention. Claims 7-10, dependent from claim 5, enjoy the same distinctions over the cited prior art.

With respect to the first *prima facie* requirement, the Office Action states that the purpose disclosed by Moon would have been recognized in the pertinent art of Suzuki, making it obvious to modify Suzuki. However, even if this statement were correct, it does not explain how an expert in the art could have modified the Suzuki reference in such a way as to describe the claimed invention. As explained above in response to the third *prima facie* requirement, even when combined, Suzuki and Moon fail to disclose several of the claimed invention limitations. The above-quoted statement from the Office Action does not explain how even a person with skill in the art could modify Suzuki's ferroelectric device (fabricated on a simple substrate), to operate overlying a channel region as a gate electrode. A *prima facie* case has not been made that the motivation to combine references comes from the Suzuki or Moon references. This assertion is true simply because all the Applicant's claim limitations cannot be found in the two references.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Suzuki/Moon references, then additional evidence must be provided. The Examiner has not supplied any explanation of how an expert could possibly modify either Suzuki or Moon to yield all the explicit limitations recited in the base claims.

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In summary, the Applicant respectfully submits that a *prima facie* case of obvious has not been supported, and the Applicant requests that the rejection of claims 7-10 be removed.

Claims 13 and 15-19 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Suzuki in view of Sakai et al. ("Sakai"; US 2003/0067022). The Office Action acknowledges that Suzuki fails to disclose a replacement gate stack, but that this feature is described by Sakai. The Office Action also states that Sakai and Suzuki are in the same field of endeavor, that the purpose disclosed by Sakai would have been recognized in the pertinent art of Suzuki, and that it would have been obvious to modify Suzuki to use a replacement gate stack. This rejection is traversed as follows.

The Sakai and Suzuki references have been combined based upon the assumption that Suzuki discloses one of the conductive oxide materials recited by the Applicant in claim 13. However, Suzuki does not anticipate the conductive oxide materials recited in claim 13, as amended. Sakai describes a ferroelectric transistor made using a replacement gate process. The resultant structure is formed from a first insulator 3, a first conductor layer 4, a FE layer 5, and a second conductor layer 6. Like Suzuki, Sakai fails to disclose any of the conductive oxide materials explicitly recited in Applicant's claim 13. Further, Sakai's structure is different, using a conductive layer 4 and an insulator 3, interposed between the FE layer and the channel region 2. With respect to the third *prima facie* requirement, even if the Suzuki and Sakai inventions are combined, the combination does not describe any of the conductive oxides listed in claim 13. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention. Claims 15-

19, dependent from claim 13, enjoy the same distinctions over the cited prior art.

With respect to the first *prima facie* requirement, the Office Action states that the purpose disclosed by Sakai would have been recognized in the pertinent art of Suzuki, making it obvious to modify Suzuki. However, even if this statement were correct, it does not explain how an expert in the art could have modified the Suzuki reference in such a way as to describe the claimed invention. As explained above in response to the third *prima facie* requirement, even when combined, Suzuki and Sakai fail to disclose several of the claimed invention limitations. The above-quoted statement from the Office Action does not explain how even a person with skill in the art could modify Suzuki's ferroelectric device (fabricated on a simple substrate), to operate overlying a channel region as a gate electrode. A *prima facie* case has not been made that the motivation to combine references comes from the Suzuki or Sakai references. This assertion is true simply because all the Applicant's claim limitations cannot be found in the two references.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Suzuki/Sakai references, then additional evidence must be provided. The Examiner has not supplied any explanation of how an expert could possible modify either Suzuki or Sakai to yield all the explicit limitations recited in the base claims.

In summary, the Applicant respectfully submits that a *prima facie* case of obvious has not been supported, and the Applicant requests that the rejection of claims 13 and 15-19 be removed.

Claim 14 has been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Suzuki in view of Sakai and Willer. The Office Action acknowledges that Suzuki fails to disclose a bottom conductive layer, but states that Willer describes such. The Office Action also states that Willer and Suzuki are in the same field of endeavor, that the purpose disclosed by Willer would have been recognized in the pertinent art of Suzuki, and that it would have been obvious to modify Suzuki to use a bottom conductive layer to improve the punch-through voltage. This rejection is traversed as follows.

The Sakai and Willer references have been combined with Suzuki primarily on the assumption that Suzuki discloses at least one of the conductive oxide materials recited by the Applicant in claim 13. However, Suzuki does not anticipate the conductive oxide materials recited in claim 13, as amended. Likewise, as noted in detail above, neither Willer nor Sakai discloses the conductive oxide materials recited in Applicant's claim 13. With respect to the third *prima facie* requirement, even if the Suzuki, Willer, and Sakai inventions are combined, the combination does not describe any of the conductive oxides listed in claim 13. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention. Claim 14, dependent from claim 13, enjoys the same distinctions over the cited prior art.

With respect to the first *prima facie* requirement, the Office Action states that the purpose disclosed by Willer would have been recognized in the pertinent art of Suzuki, making it obvious to modify Suzuki. However, even if this statement were correct, it does not explain how an expert in the art could have modified the Suzuki reference in such

a way as to describe the claimed invention. As explained above in response to the third *prima facie* requirement, even when combined, the three references fail to disclose all of the claimed invention limitations. The above-quoted statement from the Office Action does not explain how even a person with skill in the art could modify Suzuki's ferroelectric device (fabricated on a simple substrate), to operate overlying a channel region as a gate electrode. A *prima facie* case has not been made that the motivation to combine references comes from the Suzuki, Willer, or Sakai references. This assertion is true simply because all the Applicant's claim limitations cannot be found in the two references.

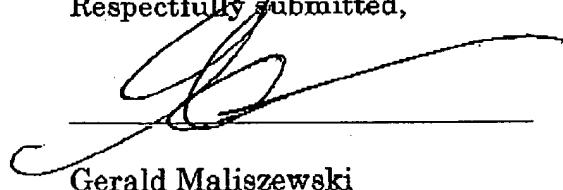
Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Suzuki/Willer/Sakai references, then additional evidence must be provided. The Examiner has not supplied any explanation of how an expert could possibly modify any of the references to yield all the explicit limitations recited in the base claims.

In summary, the Applicant respectfully submits that a *prima facie* case of obvious has not been supported, and the Applicant requests that the rejection of claim 14 be removed.

In view of the foregoing, applicant requests reconsideration of the application and requests that it be passed to issue.

Respectfully submitted,

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Gerald Maliszewski  
Registration No. 38,054

Customer Number 55,286  
P.O. Box 270829  
San Diego, CA 92198-2829  
Telephone: (858) 451-9950  
Facsimile: (858) 451-9869  
gerry@ipatentit.net